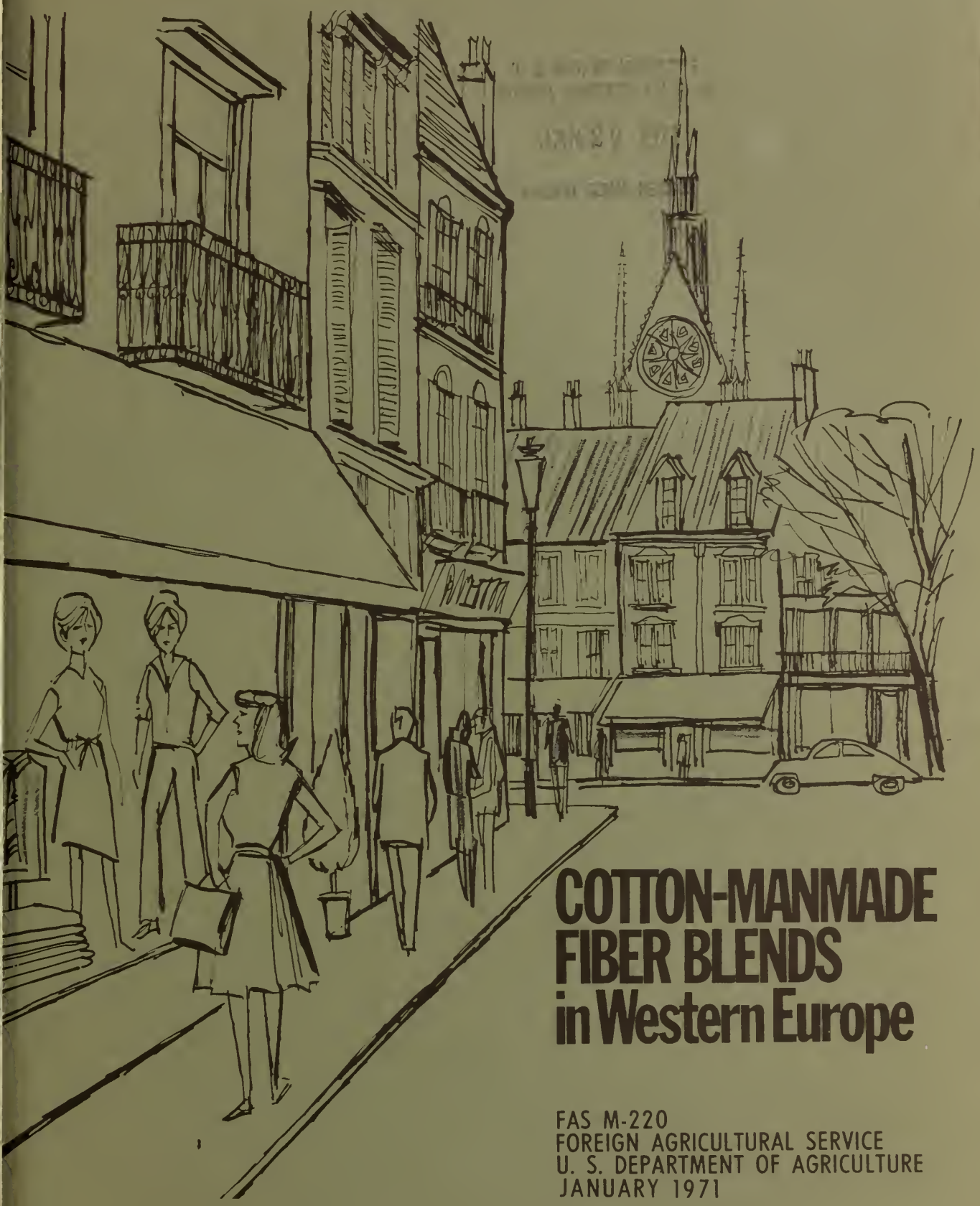

# COTTON-MANMADE FIBER BLENDS in Western Europe

FAS M-220
FOREIGN AGRICULTURAL SERVICE
U. S. DEPARTMENT OF AGRICULTURE
JANUARY 1971

## CONTENTS

## FOREWORD

This report is another of the continuing series of competition studies prepared in the Cotton Division of the Foreign Agricultural Service. These studies analyze the problems faced by U.S. cotton in maintaining markets abroad because of competition both from foreign cotton and from manmade fibers.

While competition from manmade fibers is not new, its growing importance in blends continues to accelerate. The use of manmade fibers in combination with each other and with cotton and other natural fibers has affected cotton consumption abroad. This report examines the trend to blends and the reasons therefore in the markets of Western Europe. Possible courses of action for cotton interest groups are also explored.

Other Foreign Agricultural Service publications on interfiber competition include: *Competition Between Cotton and Manmade Fibers in Western Europe,* Foreign Agriculture Report 118, June 1961; and *Cotton and Manmade Fibers–Competition in Japan,* Foreign Agricultural Report 128, January 1966.

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# COTTON-MANMADE FIBER BLENDS IN WESTERN EUROPE

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## INTRODUCTION

### Competition for cotton

In recent years the practice of combining textile fibers in yarn manufacturing (blending) has become an important influence on cotton consumption in countries of Western Europe, who use about 7 million bales of cotton a year, and, in the aggregate, generally take about one-fourth of the total exports of U.S. cotton.

This study concerns the practice of blending in some of the major markets of Western Europe. It examines the reasons for this development, attempts to evaluate blending trends, assesses the impact of blending on cotton consumption, and indicates some possible courses of action for cotton interests to prevent further erosion of cotton use.

There is little doubt that cotton is facing a challenge from manmade fibers[1] in Western Europe and that much of this competition is in the form of blends in products for which 100-percent cotton was formerly used. Some indication of this challenge is given by the following trends. The market for cotton in Western Europe in a recent year has divided into apparel (49 percent), household fabrics (32 percent), and industrial fabrics (19 percent). For industrial fabrics, cotton's share has remained at approximately the same level between 1956 and 1967. For household goods, cotton's share fell, particularly in decorative fabrics. For apparel, there were severe losses, especially in shirts and outerwear.

Unfortunately, there are few statistical data in Western Europe or elsewhere showing the quantities of blended yarns and fabrics produced. However, the information regarding the following countries indicates the growing importance of blends and is probably indicative of trends elsewhere and in Western Europe as a whole. In 1969 blended yarn constituted about 11 percent of the yarns spun in the cotton system in the United Kingdom and in 1968 about 16 percent of the yarns turned out by cotton spinners in West Germany. Based on data for the year 1969, about 16 percent of the yarn and about 29 percent of the fabric produced in Italy was blended.

### Influences on blend success

There are numerous reasons why the trend to blends in Western Europe has taken place and continues strong.

First, the giant producers of manmade fibers, who manufacture massive quantities, explore and exploit every avenue for the disposal of their fibers. The huge sums spent by manmade fiber producers to provide technical assistance, market research, and promotion are designed to help and encourage textile manufacturers to use more and more of their products. Manmade fiber promotion funds available overshadow the important but relatively small amounts spent on cotton. A technique manufacturers of manmade fiber have used to make large inroads into many of cotton's traditional markets is promoting blends of manmade fiber with cotton of specified ratios with high manmade fiber content. Theoretically, manmade fiber producers would prefer that textile manufacturers made 100-percent manmade fiber products; but promotion of blends has been too successful to abandon.

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[1] In the United States the term "manmade fibers" denotes all industrially produced fibers. These fibers are grouped into cellulosic (rayon, acetate, cupramonium), noncellulosic (acrylic, polyamide, polyester), and textile glass. Since there is no uniform terminology used in Western Europe, the U.S. system has been adopted in this report.

Second, cost and price relationships between cotton and manmade fibers and end products are important to textile manufacturers in choice of fibers. Fiber prices by themselves have some influence on manufacturer choice. Rayon is the least expensive of manmade fibers and is usually priced competitively with cotton; its price is influenced by cotton price levels. Other manmade fiber prices are relatively independent of cotton prices but have shown a strong downward trend recently as competition among producers has become more intense—especially for polyester sales. However, to the textile manufacturer, fiber prices are of secondary consideration to product profitability—and often blended products command higher prices than 100-percent cotton products for both fabric and apparel end use.

Thirdly, retailers influence the choice between cotton and manmade fibers. Blended products appeal to retailers partly because of increased profits for them resulting from higher markups and the fast turnover for blended apparel and household items. Also, retailers often benefit to a substantial degree from the advertising allowances of the manmade fiber producers.

Finally, from the standpoint of the consumer, some blended products offer price appeal when lower-priced rayon is blended with cotton in order to hold down manufacturing, wholesale, and retail costs. But for most consumers, blend product characteristics—such as permanent press—are the most important considerations.

Manmade fiber producers have been able, through trade name commercials and advertising allowances—especially for polyesters—to convince consumers that 50 percent to 65 percent of manmade fiber in a fabric is required for optimum permanent press performance with good strength and ability to withstand abrasion. Part of the reason for this is that early permanent press finishes available to cotton caused considerable deterioration in strength and abrasion-resistance characteristics. Later it was found that addition of polyester or nylon helped eliminate such difficulties. But depending on fabric construction and end use, the amounts of polyester or nylon needed for such purposes may be only 15 percent to 20 percent of a cotton-manmade blend.

### Outlook

Cotton in Western Europe will probably be subject to increased competition from manmade fibers—particularly by use in blends—in the immediate future. Expanded production of manmade fibers in Western Europe will pressure manufacturers to dispose of their products by means of extremely competitive prices and other incentives.

In the meantime, through the programs of the International Institute for Cotton (IIC), considerable technical research is being conducted on cotton. Of prime importance is that directed at improved methods of imparting permanent press characteristics to cotton. In addition, there is considerable promotion of cotton apparel based on 100-percent cotton products. Promotion of 100-percent cotton products has been a traditional policy among cotton interests, although a change may now be occurring—at least in the United States.

Further, it is possible that blends with low manmade fiber content and high cotton content might outperform blends of high manmade-fiber content, 100-percent manmade-fiber products, or 100-percent cotton items in certain end uses. If this were found to be true, cotton interests may want to establish and sponsor quality-controlled, low-level blends for specific end uses—a step to their advantage if by so doing long-term prospects for retaining a sizeable share of specific end-use markets could be foreseen.

It is also important that cotton continue to attempt to regain and expand markets by continued promotion and market research and that these efforts be fortified by adequate supplies of cotton of needed grades and staples at competitive prices supported by improved marketing practices.

## THE ART OF BLENDING

### A short history

The first blends were between different types of natural fibers rather than between natural and manmade. Although the origins of blending remain a mystery, the practice was not unknown in Biblical days. Deuteronomy 22: 11, the King James version, advises: "Thou shalt not wear a garment of diverse sorts, as of woolen and linen together." In caves in Peru, fabrics from the 11th and 12th centuries A.D. have been found that are blends of alpaca and cotton. The linsey-woolsey of England and early colonial North America was a mixture of woolen and linen or cotton yarn.

The first manmade fibers, rayon and acetate, were used by themselves in yarns and fabrics and were considered a substitute for silk or a replacement for cotton. Then, in the pre-World War II era, they were used in blends, usually with cotton, to the maximum extent possible to replace and conserve limited cotton supplies in Germany, Italy, and Japan, who had curtailed the import of cotton to conserve foreign exchange and lessen dependency on imported raw materials for their textile industries.

The first of the true synethic fibers—nylon—was introduced commercially in 1939; it was followed by acrylics, polyesters, and others. At first these too were used by themselves in yarns and fabrics, and not until the early 1960's did the practice of blending manmade fibers and natural fibers become important.

Blending has now become a studied art in spinning and weaving rooms. Generally, the present objective of blending and mixing yarns is not to extend supplies of natural fibers but is to achieve purposes far more technical and sophisticated. Some of the more important reasons for blending are: to keep yarn, fabric, and end-product costs down; to increase profit margins; to capitalize on brand-name advertising of fiber producers; to achieve technical characteristics, such as increased strength to tolerate permanent-press finishes; and to obtain other special qualities not obtainable from products of single fibers.

## Types of blends

There is a great variety of textile raw materials, both natural and manmade. Much is used in yarns of single components, but in recent years, a growing proportion of textile fibers is manufactured into yarns in combination with other textile fibers. Theoretically, an almost endless number of possible combinations can be made; in practice, however, economic considerations, technical problems, practical application, consumer acceptance, and so forth, set some limit on the variety of fiber combinations that go into textile end products.

Blending can be achieved on each of the major spinning systems—cotton, woolen, and worsted. It may be accomplished in several places in the textile manufacturing process. Some textile writers consider blending in the fiber stage as "intimate blending" and beyond the yarn stage as "mixing." In a sense, bicomponent manmade fibers could be considered blends. In this report, however, "blending" is defined as encompassing only the combination of fibers in the yarn-spinning process. This includes blending fibers in the formation of yarns, plying yarns of blends with other yarns of blends or of a single fiber, and twisting fibers around a previously spun yarn of another fiber, as in a core yarn. The combination of fibers beyond yarn processing will be referred to as "mixing."

While wool-manmade fiber blends are important to the textile industry, this study will be concerned only with blending on the cotton spinning system, which, of course, has the greatest implications for raw cotton consumption.

On the cotton spinning system, blended yarns are made from cotton and rayon (both regular and high wet modulus types), cotton and polyester, polyester and rayon, and many other combinations of two or more fibers. It is believed that in Western Europe, as in the United States, the single most important of the fiber blends is cotton and polyester. (In the United States in 1969 textile manufacturers produced 5.4 billion linear yards of manmade fiber fabrics of all types, of which 35 percent were polyester-cotton blends. In addition, large quantities of fabrics that were blends of polyester and "other fibers" and of fabrics of other fiber blends were also produced.)

**Blend ratios.**—Even though a spinner's choice of blend ratios is limited by the fibers used, yarn size, fabric type, and the intended end product, relative profitability and prescribed blend ratios also bear on the choice. Companies producing manmade fibers exert a substantial influence on blend ratios—particularly the blend levels used for their branded, well-advertised fibers. Blend ratios of the branded fibers, therefore, tend to have a very large proportion of manmade fibers and to be standardized. The use of fiber brand names is usually coupled with quality controls enforced by fiber manufacturers.

Fibers sold without brand names, such as regular rayon and unbranded polyester, are used in various blend ratios, such as 75/25, 65/35, 55/45, 50/50, and 25/75. The proportion of high wet modulus rayon used with cotton is often 50 percent of each fiber.

In Western Europe the most common polyester-cotton blend is a 65/35 ratio specified by the large suppliers of polyester fiber. Although polyester-cotton blends of 80/20 are manufactured, 65-percent polyester is probably the maximum proportion that can be used in most types of fabrics, particularly light-weight fabrics, without

substantially reducing the end-use qualities contributed by cotton, such as comfort and appearance. A 50/50 cotton-polyester ratio is also fairly standard in heavy-weight fabrics; and this ratio may become more common in light-weight fabrics where suitable.

Substitution of rayon, especially high wet modulus rayon, for the cotton portion in 65/35 polyester blends is gaining importance in Western Europe. However, with changing competitive conditions, blends with lower polyester content are also being manufactured. One of the major low-level blends is shirting and dress-weight fabric containing 84 percent cotton and only 16 percent polyester or nylon. ("Low-level blends" have been described by the National Cotton Council of America as containing 15 to 20 percent manmade fiber and "high-level blends" as those with 50 to 80 percent manmade fiber; the other fiber in both types of blends is defined as cotton.[2])

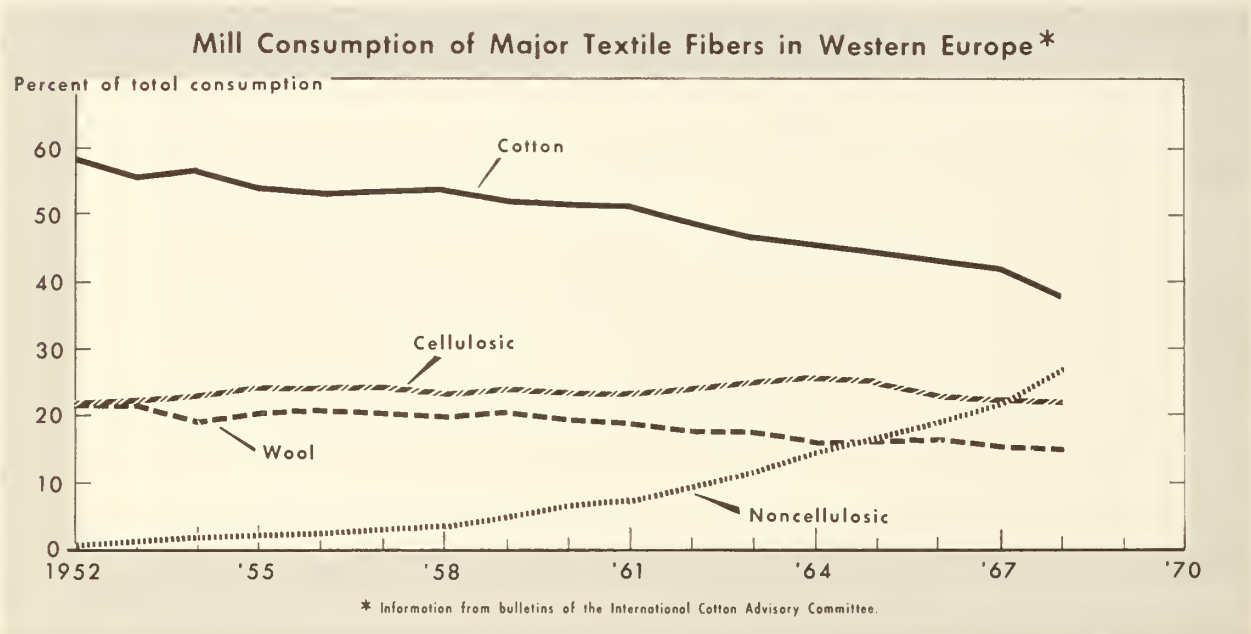
For special effects, blends of more than two fibers are produced for knit and woven outerwear. In determining blend ratios for specific yarns and fabrics, the manufacturer must take into account the relative importance of the characteristics of fibers used. For example, natural fibers contribute greater covering power, softness, and dyeability; manmade fibers give greater tensile strength and sheen.

## Effects on cotton consumption

In the short run, the practice of blending will probably continue to erode cotton's market in Western Europe. However, in the long run, under some circumstances and in some end uses, blending will probably carve out a larger market for cotton than might otherwise prevail. To the extent that blended yarns and fabrics are used for products that have been traditionally 100 percent cotton, cotton is disadvantaged by blending. Where blended cotton-manmade fiber yarns and fabrics are substituted for yarns and fabrics that are 100 percent manmade fibers, blending assists cotton. In any given end use, cotton markets could also be improved if blends of higher cotton content were substituted for blends in which cotton is a minor component.

Two factors could improve the cotton market in Western Europe. Competitive cotton prices in relation to rayon and polyester staple and an adequate cotton supply in the staple lengths and qualities needed would help to slow the trend to blends with high content of manmade fiber. More satisfactory permanent-press treatment for all-cotton fabrics would also work in cotton's favor.

Unfortunately, in most countries statistics are not available on the amounts and types of blended yarns and fabrics manufactured to show cotton consumption trends. However, the advance in consumption of manmade fibers on cotton system spindles between 1952 and 1968 in Western Europe can be seen on the following chart.




[2] *The Impact of Fiber Blending on Cotton Consumption*, by Charlie W. Russell, National Cotton Council of America, March 1966, p. 2.

From all indications, it is reasonable to assume that a growing proportion of the manmade fibers consumed is going into blends although in some countries rapidly increasing quantities of manmade fibers are used without blending in floor coverings and for industrial end uses.

At present, the practice of blending is more widespread in the United States and in Japan than in Western Europe. In the past, developments in the United States and Japan in the textile industry have foreshadowed developments in Western European textile industries.

## PRODUCTION OF YARN AND FABRIC

### Classification

According to present practices governing collection of international production and trade statistics, yarns and fabrics are classified according to the fiber that has the major weight in the product. (An exception is in the United States, where yarns and fabrics are classified according to the fiber of chief monetary value.) Therefore, in international practice, yarns and fabrics that are 50 percent or more cotton by weight are counted as cotton; those with 50 percent or more manmade fibers by weight are counted as manmade.

Blends with equal weights of two different fibers are classified according to which fiber content has the highest monetary value. Therefore, 50/50 cotton-polyester blends are counted as manmades because polyester is generally a more expensive fiber than cotton.

In blends containing almost equal weights of two fibers, minor shifts in fiber content could cause a yarn or fabric to be classified differently. For example, statistics showing rising production of manmade fiber yarns and fabrics may not really represent a correspondingly greater use of manmade fibers. The rise may, to some extent, indicate a shift to yarns and fabrics with sufficiently higher manmade fiber content to cause them to be counted as manmades instead of as cotton.

### Trends and data

Statistics on production of blended yarns and fabrics are scarce, and data showing comparisons of blend production in different countries or blend production for Western Europe as a whole are unavailable.

However, information on blended yarn and fabric production has been found that pertains to the United Kingdom, Italy, and West Germany. The data extend over a sufficient time period to show the growing importances of blends in these three countries. This conclusion about trends is supported by limited available figures from other countries in Western Europe. A further indication of the growing importance of blends is the trends in the amounts of 100-percent cotton yarn produced on the cotton spinning systems and 100-percent cotton fabric produced in the different countries.

**West Germany.**—Total yarn production of West German cotton spinners increased from 254,107 metric tons in 1952 to 321,416 metric tons in 1968 Blended yarns were not quite 15 percent of the total in 1952 and dropped to 9 percent by 1961. However, blended-yarn output increased to reach almost 16 percent of total West German production by 1968. Production of all types of yarns containing noncellulosic staple rose from 225 metric tons in 1958 to 47,113 metric tons in 1968. Of this quantity, over half was blended yarn, and noncellulosic-cotton yarn was the fastest growing type.

**United Kingdom.**—Data on yarn production on the cotton spinning system in the United Kingdom indicate that blends not including blends of manmade fibers only, averaged just over 6.2 percent of total yarn spun in the years 1963-65. By 1969 blended yarns had risen to 11.0 percent of total spun yarn production. It is significant that production of blended yarn rose, actually and relatively, although total yarn production dropped in the same period.

**Italy.**—Italian data show that production of blended yarn and fabric is increasing. Blends accounted for 16.5 percent of all spun yarns in Italy in the year 1969. And blends and mixtures were 29.1 percent of all fabric produced during the same period.

Yarn of cotton-manmade blends were almost 95 percent of all blended yarns in both 1960 and 1969. Over this period there was a large increase in the production of blended manmade fiber yarns of cellulosics and noncellulosics although these remained less than 10 percent of all blended yarn. Italian production of blended and mixed fabrics about doubled between 1960 and the end of 1969.

The dynamic surge in blended yarns and fabrics in the 1960-69 period is all the more striking if one considers the diminishing total production of spun yarn and fabric, the declining production of all-cotton yarn and fabric, and the lack of growth in other types of manmade fiber spun yarns and fabrics.

Production of yarns by West German cotton spinners

| Year | Yarn type | | | | | | | | Total yarn | Total blended yarns | Blended yarns as percentage of total yarns |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cotton[1] | Cotton/ rayon staple | Rayon staple | Cotton/ noncellulosic staple | Rayon/ noncellulosic staple | Noncellulosic staple other than blends | Total staple containing noncellulosics | Other yarn | | | |
| | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Percent* |
| 1952 | 161,432 | 36,687 | 52,693 | (2) | (2) | (2) | 225 | (3,070) | 254,107 | 36,687 | 14.6 |
| 1956 | 232,097 | 39,328 | 71,674 | (2) | (2) | (2) | 929 | (5,110) | 349,138 | 39,328 | 11.4 |
| 1958 | 238,096 | 35,820 | 63,131 | (2) | (2) | (2) | 2,014 | 5,975 | 345,036 | 35,820 | 10.6 |
| 1959 | 240,567 | 31,571 | 66,253 | (2) | (2) | (2) | 3,816 | 5,078 | 347,285 | 31,571 | 9.2 |
| 1960 | 260,105 | 33,344 | 67,767 | (2) | (2) | (2) | 4,931 | 5,214 | 371,361 | 33,344 | 9.1 |
| 1961 | 253,312 | 31,306 | 62,263 | (2) | (2) | (2) | 4,982 | 4,860 | 356,723 | 31,306 | 8.9 |
| 1962 | 234,538 | 26,548 | 58,686 | 1,549 | 2,081 | 5,509 | 9,139 | 5,345 | 334,256 | 30,178 | 9.2 |
| 1963 | 221,946 | 30,179 | 59,201 | 2,158 | 2,960 | 5,497 | 10,615 | 4,140 | 326,081 | 35,297 | 11.0 |
| 1964 | 226,059 | 27,061 | 64,583 | 3,167 | 6,324 | 7,547 | 17,038 | 4,360 | 339,101 | 36,552 | 10.9 |
| 1965 | 225,085 | 24,052 | 64,198 | 3,824 | 8,598 | 10,343 | 22,765 | 4,776 | 340,876 | 36,474 | 10.9 |
| 1966 | 217,947 | 22,595 | 51,837 | 7,361 | 7,968 | 12,819 | 28,148 | 3,581 | 324,108 | 37,924 | 11.8 |
| 1967 | 193,437 | 22,840 | 48,045 | 8,686 | 8,191 | 12,367 | 29,244 | 2,669 | 296,235 | 39,717 | 13.5 |
| 1968 | 192,751 | 25,812 | 52,963 | 15,578 | 9,365 | 22,170 | 47,113 | 2,777 | 321,416 | 50,755 | 15.9 |

[1] Not including yarns spun on the two-cylinder system or waste yarn. [2] Not available.

Source: Gesamtverband der Textilindustrie in der Bundesrepublik Deutschland, *Die Textilindustrie der Bundesrepublik Deutschland im Jahr 1968.*

Production of spun yarn in the United Kingdom

| Year | Yarn type | | | | | | Total blended yarns | Blends[2] as percentage of total yarn |
|---|---|---|---|---|---|---|---|---|
| | Cotton | Rayon | Noncellulosic[1] | Cotton/ manmade fiber blends | Other blends | Total yarn | | |
| | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Percent* |
| 1963 | 394.6 | 74.8 | 13.1 | 30.3 | 2.8 | 515.5 | 33.1 | 6.4 |
| 1964 | 412.4 | 86.3 | 20.7 | 29.7 | 2.6 | 551.7 | 32.3 | 5.9 |
| 1965 | 392.9 | 73.6 | 27.0 | 31.5 | 2.2 | 527.1 | 33.7 | 6.4 |
| 1966 | 368.1 | 68.4 | 21.4 | 35.2 | 2.2 | 495.3 | 37.4 | 7.6 |
| 1967 | 307.8 | 61.8 | 23.3 | 30.0 | 1.7 | 424.5 | 31.7 | 7.5 |
| 1968 | 303.9 | 65.3 | 35.9 | 38.2 | 1.1 | 444.4 | 39.3 | 8.8 |
| 1969[3] | 292.3 | 53.2 | 50.0 | 49.0 | 1.4 | 445.9 | 50.4 | 11.3 |

[1] Includes blends with rayon. [2] Does not include noncellulosic-rayon blends. [3] Years includes 53 weeks.

Source: The Textile Council, *Quarterly Statistical Review,* Spring 1970, Manchester, United Kingdom.

**Production of cotton and manmade fiber spun yarn in Italy**

| Year | Yarn type | | | | | | | Total yarn[2] | Blends as percentage of total yarn |
|---|---|---|---|---|---|---|---|---|---|
| | Cotton | Blends | | | | Cellulosic | Noncellulosic | | |
| | | Cotton/ cellulosic | Cotton/ noncellulosic | Total cotton/ manmade fiber | Other[1] | | | | |
| | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Percent* |
| 1960 | 193,457 | ([3]) | ([3]) | 9,861 | 593 | 29,627 | 342 | 238,554 | 4.4 |
| 1961 | 193,110 | ([3]) | ([3]) | 11,410 | 431 | 29,093 | 339 | 239,315 | 4.9 |
| 1962 | 194,654 | ([3]) | ([3]) | 12,753 | 914 | 35,223 | 700 | 249,211 | 5.5 |
| 1963 | 191,278 | 16,312 | 2,966 | 19,278 | 862 | 34,408 | 1,126 | 251,406 | 8.0 |
| 1964 | 185,165 | 14,808 | 3,405 | 18,213 | 745 | 31,190 | 1,417 | 240,133 | 7.9 |
| 1965 | 157,071 | 10,947 | 3,880 | 14,827 | 604 | 24,821 | 1,450 | 201,120 | 7.7 |
| 1966 | 197,070 | 15,560 | 7,891 | 23,451 | 921 | 25,180 | 2,148 | 251,431 | 9.7 |
| 1967 | 194,592 | ([3]) | ([3]) | 23,300 | 1,294 | 22,892 | 1,796 | 246,751 | 10.0 |
| 1968 | 178,167 | ([3]) | ([3]) | 25,871 | 1,466 | 23,266 | 1,285 | 233,248 | 11.7 |
| 1969 | 181,784 | ([3]) | ([3]) | 39,455 | 2,524 | 23,857 | 2,924 | 254,442 | 16.5 |

[1] Principally blends of cellulosic and noncellulosic staple. [2] Includes waste yarn. [3] Not available.

Source: Associazione Contoniera Italiana, *Industria Contoniera,* Milan, Italy.

**Production of cotton and manmade fiber fabrics in Italy**

| Year | Cotton | Blends | | Manmade fiber | Filament | | | Total | Blends as percentage of total |
|---|---|---|---|---|---|---|---|---|---|
| | | Cotton/ manmade | Other[1] | | Cellulosic | Noncellulosic | Total | | |
| | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Metric tons* | *Percent* |
| 1960 | 133,562 | 5,814 | 19,189 | 20,688 | 3,605 | 420 | 4,025 | 183,278 | 13.6 |
| 1961 | 131,197 | 5,173 | 20,750 | 21,146 | 3,638 | 295 | 3,933 | 182,199 | 14.2 |
| 1962 | 136,809 | 5,870 | 22,239 | 24,359 | 4,478 | 391 | 4,869 | 194,146 | 14.5 |
| 1963 | 137,139 | 8,880 | 24,842 | 26,633 | 4,385 | 406 | 4,791 | 202,285 | 16.7 |
| 1964 | 126,771 | 7,883 | 23,728 | 21,544 | 3,705 | 608 | 4,313 | 184,239 | 17.2 |
| 1965 | 96,961 | 5,611 | 23,564 | 15,827 | 3,214 | 648 | 3,862 | 145,825 | 20.0 |
| 1966 | 120,306 | 12,559 | 27,748 | 12,213 | 4,784 | 663 | 5,447 | 178,273 | 22.6 |
| 1967 | 118,097 | 14,563 | 30,159 | 9,534 | ([2]) | ([2]) | 7,091 | 179,444 | 24.9 |
| 1968 | 111,084 | 15,190 | 30,884 | 8,882 | ([2]) | ([2]) | 7,644 | 173,684 | 26.5 |
| 1969 | 108,802 | 19,122 | 32,360 | 7,926 | ([2]) | ([2]) | 8,442 | 176,652 | 29.1 |

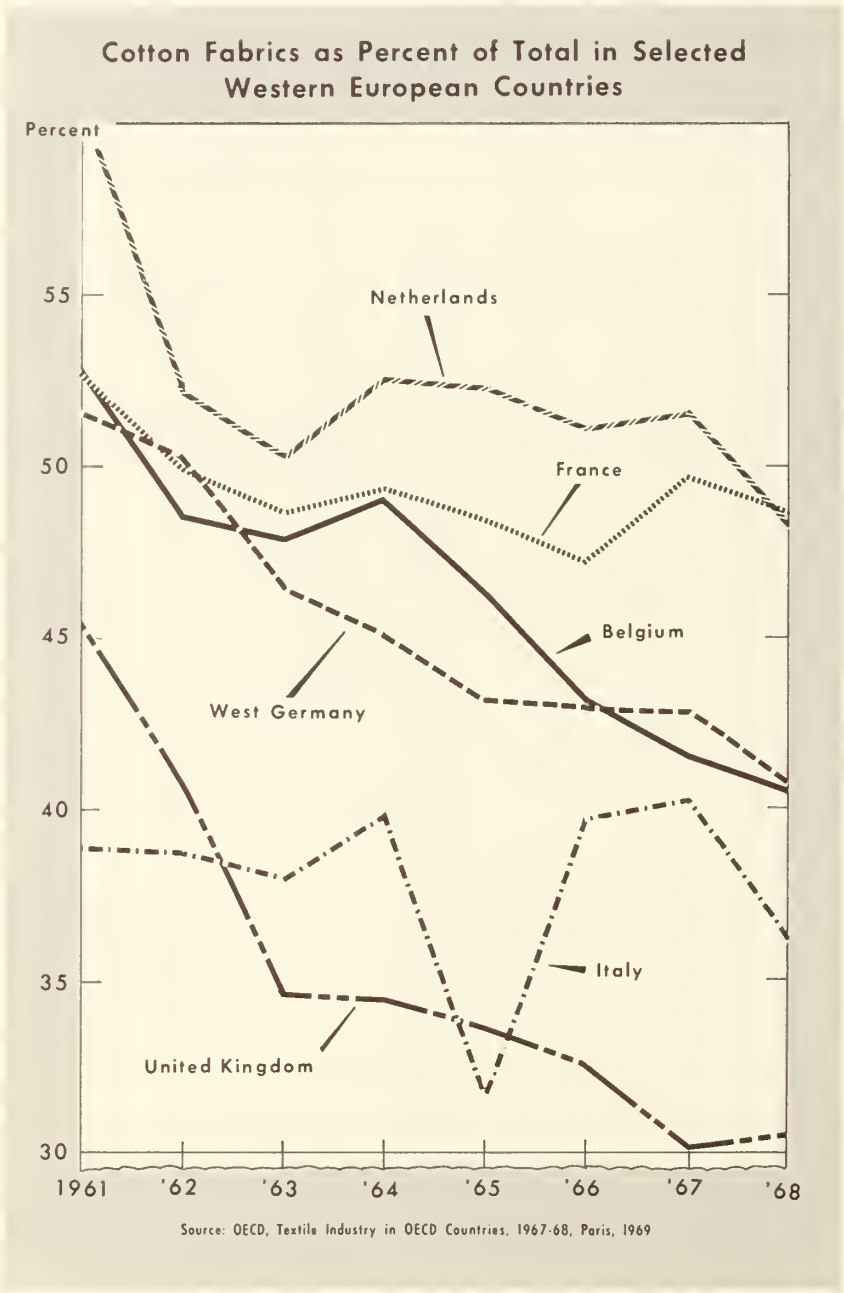
[1] Believed to be principally blends and/or mixtures of cotton or manmade staple with manmade filament yarn. [2] Not available.

Source: Associazione Cotoniera Italiana, *Industria Cotoniera,* Milan, Italy.

Overview.—Blended fabrics are already important in Western Europe for some end uses such as raincoats and, to a lesser extent, men's shirts. For example, it was estimated that in the high-volume chain outlets of Italy about 60 percent of men's shirts (not including knitted sport shirts) were made of blended fabrics in 1968. By far the largest proportion of the blended fabrics was the "standard" 63/35 polyester-cotton blend. In Western Europe as a whole, an even higher proportion of raincoats are made of blended fabrics.

Since fabrics with permanent-press qualities have gained considerable consumer acceptance in Western Europe despite their relatively higher prices and other drawbacks, it is likely that such fabrics will enter in greater volume other end uses in the near future. Probable end uses are women's and children's dresses, blouses, and other outerwear. Sales of blended fabrics in sheets and pillowcases may also increase.

In summary, it may be assumed that the growth in production of blended yarns and fabrics will continue in Western Europe as it has in the United States. The accompanying chart shows the changes in production of fabrics that took place from 1961 through 1968.



## Manmade fiber producers

Manmade fibers are produced by large manufacturing companies who exercise considerable control over fiber supplies. New fibers are controlled because production and distribution are governed by patents and by licensing agreements with patent holders. Manufacturers also can govern the use of fibers for which brand names carry strong consumer acceptance even when patents expire. Manufacturers, however, are not able to exercise control over fibers that are merchandised as a commodity, unless demand remains in excess of supply for a significant period of time.

As original and secondary patents governing the manufacture of various fibers run out, competition between fiber-producing companies intensifies, and the extent of manmade fiber producers' control is diminished. This phenomenon has affected the ratios of manmade fibers in blended yarns and fabrics.

For example, blend ratios for rayon and acetate that are merchandised on an unbranded basis are discretionary with the spinners, although manmade fiber producers undoubtedly encourage their customers to use maximum quantities of their fiber in blends.

**Patent status.**—Patents have long since expired on the original production processes for regular rayon. And more recently they lapsed on regular nylon, polyester, and some other types of manmade fibers. Manufacturers of regular rayon, now sell it competitively, within certain limitations, often without regard to brand name. It is merchandised as a commodity rather than as a prestige fiber. On the other hand, newer fibers, such as the high wet modulus rayon, are governed by restrictions laid down by the patent holders, and, when merchandised with a brand name, command premium prices.

The situation with respect to polyester fiber, the major manmade fiber used in blended yarns, is in transition, in view of the recent expiration of basic patents in the United Kingdom and the patents and licensing agreements in other countries.

**The polyester story.**—In 1947, the basic patent on processes for the manufacture of polyester fiber was assigned to Imperial Chemical Industries (ICI) of the United Kingdom by the original patent holders, Whinfield and Dickson of the Calico Printers Association, under whose auspices polyester was developed. The agreement between ICI and the patentees was to run for the duration of the patent.

When ICI began manufacturing polyester, it had neither the resources to make it outside of the United Kingdom nor the capacity to satisfy foreign demand. As a consequence, licenses were granted to producers in France, Italy, West Germany, the Netherlands, and Japan who applied for and received patents in their respective countries. The licensing agreements governed the sale and use of polyester, and provided restrictive covenants that prevented ICI and their licensees from entering specified marketing territories.

Through the licensing agreements, ICI retained control of polyester prices, uses, and distribution. Licensees were required to obtain agreements from their customers that branded polyester fiber would be used in blended fabrics at ratios of no less than 65 percent polyester for apparel fabrics. Eventually, for heavy fabrics no less than 50 percent polyester was permitted. The terms of the sale contracts between fiber producers and users, therefore, carried the predetermined blend ratios into the spinning room. Uncooperative spinners did not receive branded fiber. Licensing agreements also required textile manufacturers, knitters, converters, and apparel manufacturers to maintain specified quality standards for goods incorporating branded polyester, in return for which they were permitted to use the fiber trade name and often received advertising allowances.

**Patents and problems.**—The problems involved in the use of manmade fibers subject to control by manufacturers may be illustrated by the situation that developed between manmade fiber producers and a group of spinner-weavers in West Germany who joined to produce and promote under the brand name "Supercotton-S" a standardized range of fabrics with yarns of 84 percent cotton and 16 percent manmade fibers, either polyester or nylon. Manmade fiber manufacturers threatened to refuse delivery of polyester fiber for blend ratios lower than they prescribed but finally capitulated when the textile manufacturers as a group threatened to use imported fiber. While the manmade fiber producers may have had legal right on their side, they chose to deliver supplies rather than engage in further controversy over the blend ratios and lose valued customers for their fiber.

As the basic and secondary patents on the manufacturing processes for polyester expired, licensing agreements lost force; consequently, manmade fiber manufacturers' hold over this aspect of fiber blending weakened in most countries. A larger amount of polyester fiber became available in Western Europe from increased imports and increased production which, through competitive pressures, caused prices to decline. These developments in turn encouraged more experimentation by textile manufacturers with blends of low polyester fiber content and the use of polyester in end products that had previously, because of price relationships, been all cotton.

Despite new conditions permitting changed polyester content in blends, however, many spinners continue to use prescribed percentages in order to capitalize on the well-implanted brand images of manmade fiber producers.

**Interlocking relationships.**—Manmade fiber producers in several countries of Western Europe own or are associated with textile producers. This relationship, it is suspected, influences the use of manmade fibers. While it is not possible to determine the extent of the commitment of textile and apparel companies to the use of manmade fibers alone and in blends as a result of such associations, it is not unreasonable to assume that there exists a strong incentive to use manmade fibers.

An example of interlocking relationships in France is the holding company Rhone Poulenc S.A., which owns controlling interest in four companies that, combined, make a full range of manmade fibers; the company also has a 49.9-percent-interest ownership in one of the two makers of textile glass fiber in France. In addition, Rhone Poulenc is important in the production of broadwoven goods.

It is also thought that in Germany and Austria the largest manmade fiber producers have some association with fiber-using companies.

In the United Kingdom, the relationship between fiber-producing and fiber-using companies is a matter of public knowledge and government concern. The two largest manmade fiber producers, Imperial Chemical Industries (ICI) and Courtaulds, Ltd., are associated with or own outright important textile manufacturing companies.

Courtaulds, Ltd., is not only one of the two largest manmade fiber producers in the United Kingdom but is also the largest textile producer. It owns over a million out of a total of 3.8 million cotton-system spindles in the United Kingdom. Courtaulds has been in the textile and apparel business for a long time. But since 1963 enormous sums have been spent in the acquisition of textile firms and the expansion and reequipment of existing facilities. As of December 1969, Courtaulds owned 100 percent of the common stock of 11 large and diversified textile and apparel companies and controlling interest in three others in the United Kingdom.

ICI owns substantial, but not controlling, interests in four textile manufacturing companies, including English Calico, Ltd., one of the biggest. Early in 1970 the British Government gave permission for ICI to proceed with its bid for a larger financial interest in the textile industry by taking over Viyella International, a major textile firm, and merging it with Carrington and Dewhurst. Carrington and Dewhurst is strong in the production of yarn and cloth and Viyella in finished textiles. The government attached several conditions to approval of the takeover bid, including a prohibition against influencing the choice of fibers that the new group will use.

Even in an era where increased manmade fiber supplies and lower prices will encourage textile manufacturers to produce blends that are not prescribed by manmade fiber producers, the close ties between manmade fiber producers and users in these several countries will undoubtedly contribute to continued production of textile products with a high percentage of manmade fiber content.

**Who really pays advertising costs?**—Manmade fiber producers readily admit that advertising costs are built into the sales prices of the fibers being promoted. Recipients of promotion funds realize the true source of the funds but are convinced of the tremendous benefit to the sale and profitability of their products derived from manmade fiber producer promotion campaigns.

The price spread between branded and unbranded polyester indicates the advertising load carried by branded fibers. Therefore, spinners themselves finance the promotion of branded fiber for their products by paying higher prices for branded than unbranded polyester. This increased fiber cost is multiplied as it is passed through the manufacturing and distributing chain and is eventually reflected in the retail price of the textile product.

There is little doubt that this kind of promotion has been responsible for the wide acceptability of 65/35 polyester-cotton blends, even though other ratios with lower manmade fiber content could have provided the same or better end-use qualities.

The amount of promotion money spent when a new fiber is introduced exceeds the amount spent at a later time when the demand is established. In the beginning, manmade fiber producers put more money into a campaign than is

expected in immediate returns. As the prices of manmade fibers are reduced, promotion funds from producers are likely to be curtailed.

While price reductions on polyester will reduce some of the large sums that have been available for promotion for branded fiber, outlays for technical services at the mill level are not expected to be cut.

## Promotion of manmade fibers

Manmade fiber producers have strong technical and market research and public relations departments directed to creating outlets for their products. Their activities extend from market research at the retail and consumer levels to direct institutional advertising of manmade fibers by brand names and to technical services at the manufacturing stage. By these methods manmade fiber producers have been able to build a prestige image for their branded products, particularly the noncellulosics, as they were introduced to the public. The same techniques are being used for the multitude of manmade fibers that have been developed with various special characteristics.

Manmade fiber producers finance tremendous campaigns to implant the brand names of specific fibers in the minds of consumers. Funds are used for advertising campaigns for spinners, weavers, knitters, and apparel manufacturers by which the manmade fiber brand name is linked with the trade marks of the producer of fabric and apparel. Manmade fiber producers, apparel manufacturers, and retail stores enter into agreements whereby most often each contributes one-third to the retail store's total advertising bill for specific products. Other agreements have ranged upward to 85 percent of the retail store's promotion cost. Sometimes apparel manufacturers receive 50 percent of their total advertising costs from manmade fiber producers. In other cases, certain advertising costs of spinners and/or weavers are covered completely by the funds from manmade fiber producers.

Brand names are important in the penetration of markets within Western Europe, especially by other than national producers. Radio and television programs and newspapers and magazines cross national borders freely and are an important source of information for consumers. By such means, consumers are conditioned to request manmade fiber products by brand name. These promotion campaigns have also been important in the creation of demand for blends.

Although they may hold no particular brief for manmade fiber products, large department stores and chain stores willingly add their own names to manmade fiber producers' in order to capitalize on their promotion. Where small independent retailers account for the bulk of retail sales, cooperative advertising is not a factor.

**Promotion switches.**—With the coming of new producers of polyester to the Western European arena and the expiration of agreements to keep out of each others markets, the promotion of polyester is undergoing basic changes. Polyester producers are reported to be reducing their promotion efforts in established markets and at the same time expanding promotion in markets that are being entered. For example, polyester producers in West Germany are thought to have considerably reduced their promotion budgets for their previously exclusive marketing area (West Germany, Switzerland, and Austria) but have begun strong promotion campaigns in France, Scandinavia, the United Kingdom, and other Western European markets. New polyester producers in Western Europe are also adding to the total funds available for promotion.

While there are numerous pressures toward the sale of polyester on a commodity rather than a brand-name basis, it is thought that well over half of the polyester in Western Europe continues to be sold on a brand-name basis and as a consequence benefits from fiber producers' promotion.

## Promotion of cotton

The budgets of manmade fiber producers for promoting their branded fibers in Western Europe are many times the sums spent by cotton interests for cotton promotion and technical and market research. The annual promotion sum for cotton interests in Western Europe is estimated as something under $10 million. One Italian manmade fiber producer is said to have spent $2.4 million for polyester promotion alone in 1965. The outlay for cotton promotion in Italy that year amounted to only $400,000.

U.S. cotton interests have fostered cotton promotion abroad since 1956. In that year the Cotton Council International (CCI) and various cotton institutes in a number of countries in Western Europe and Japan, in cooperation with the U.S. Department of Agriculture, undertook widespread programs on behalf of cotton. Compared with manmade fiber promotion, budgets have been limited; but despite the limited budgets, much has been done. Market research, promotion, and public relations for cotton have also been undertaken, including the

sponsorship of the U.S. Maid of Cotton, promotions for Cotton Weeks, etc. Cotton wardrobes by top designers have been modeled at fashion shows held in leading department stores and at charity events for added publicity. Other exporting countries, mainly Egypt and the Sudan, also have programs directed to promoting sales of their cotton, although, by comparison with the United States, their effort has been relatively small.

National efforts at cotton promotion and research have been supplemented by an international effort that began in February 1966. A group of cotton-exporting countries, realizing their common problem inherent in increased competition for raw cotton from manmade fibers, formed an organization called the International Institute for Cotton (IIC) for the international promotion of cotton. This organization provides a broad financial base for cotton promotion and research activities—initially in Western Europe and Japan. Member countries of the IIC are Brazil, Greece, India, Mexico, Spain, Tanzania, Uganda, and the United States.

The IIC budget for Western Europe is currently about $2.9 million, an amount at least matched by cooperators, making the total for promotion and research generated by IIC $5.8 million or more. Even this sum is small in comparison with promotion and research for manmade fibers, but it serves to give added strength to cotton's efforts to hold and regain markets. Other cotton exporting countries have indicated interest in becoming members of IIC. Through such further international cooperation among cotton interest groups, the IIC program might be expanded even further.

## Technical requirements in textile manufacture

Technical aspects, profitability, and competitive advantages are probably the most important considerations in yarn and fabric production; yet they cannot be disassociated with the end use or the end-user requirements for the products. For the textile manufacturer, basic economics have a strong influence on blend levels and the marketing of textile products.

Permanent press:—a major impetus to blends has been consumer demand, capitalized by manmade fiber producers, for permanent press qualities in apparel and household textiles. The use of permanent press in Western Europe and Japan lags behind use in the United States. This may be explained in part by differing marketing requirements, a public perhaps somewhat less susceptible to mass advertising, and the greater use in the United States of tumble dryers in the home, which are needed for the optimum performance of permanent press finishes. Then, too, there may be a disinclination of apparel producers, in some countries at least, to try something new—particularly if it involves an outlay for capital equipment such as costly, space-consuming curing ovens for the post-cured treatments. Permanent press processing methods using the pressing sequence require modification of garment finishing processes and also capital outlay for presses that operate at higher temperatures with precise temperature and timing controls. Alternatively, permanent press finishing may be contracted out on a commission basis. In garment manufacturing all components—thread, zipper tape, pocketing, etc.—must be compatible with the characteristics of permanent press fabrics, which itself can be a problem.

The name "durable press" or "permanent press" first came into use in 1964. It was an outgrowth of improvement in easy-care textile properties that began with "crease resistant" finishes in about 1945. "Wash and wear," current from about 1955 to 1965, finally evolved into "permanent press" about 1964. At each stage, wrinkle recovery and wash-and-wear properties were improved. "Permanent press" treatments also made possible sharp creases and flat, pucker-free seams that survived laundering.

Early all-cotton permanent press garments showed considerable loss of strength and had insufficient resistance to abrasion; these weaknesses could to some extent be overcome by the use of heavier cotton fabrics for permanent press apparel. Also, the addition of 15 percent to 20 percent nylon or polyester fiber helped overcome the abrasion problem. But it was generally believed that a higher level of polyester content was required to overcome the loss of strength by cotton and other cellulosic fibers resulting from permanent press finishes. High content of manmade fiber, however, is not necessary.

For example, the spinner-weavers in West Germany who promoted Supercotton-S, a standardized fiber blend utilized for permanent press products, spin 84 percent cotton and 16 percent manmade fiber, which may be either nylon or polyester. The Supercotton S association is financed by collections based on the volume of weavers' production of this type of fabric, and the registered trade name Supercotton-S is protected by licensing arrangements with cutters who, upon meeting certain standards of quality, are permitted to use the name. This blend has been particularly important for shirts and sheets.

Other manufacturers specializing in wash-and-wear fabrics have overcome complaints resulting from poor abrasion performance on the collars and cuffs of all-cotton shirts by using blends of 30 percent manmade fiber and 70 percent cotton for the parts getting especially hard wear. The body of the shirt remains treated all-cotton, which has very good wash-and-wear characteristics.

While abrasion resistance is an advantage claimed for polyester- or nylon-blended yarn, research of the New Textile Development Laboratory (TNO) in Delft, Netherlands, has produced some interesting results that are contrary to general findings in this area. In studies of polyester-cotton blend shirting-weight fabric containing 10 percent to 100 percent polyester, TNO found that almost as much abrasion resistance was obtained when the blend contained about 21 percent polyester as with higher polyester content. Tests were conducted on both untreated and resin-finished fabrics. These findings were corroborated by tests conducted by the Shirley Institute of Manchester, England, which showed that a blend of 80 percent cotton and 20 percent manmade fiber produced the best combination of desirable characteristics. This percentage of manmade fiber content is considerably lower than the 65 percent or 50 percent polyester content that has become widely standardized.

While the demand for permanent press has contributed greatly to the trend toward blends, cotton's situation with respect to permanent press may improve if the countermeasures undertaken by cotton interests bear fruit. Textile manufactures have found that it is possible to change the yarn count and construction of some types of all-cotton fabrics to overcome some of the deleterious effects of present permanent press finishes. Research aimed at overcoming the disadvantage of strength loss has been of prime urgency to cotton interests, but some of the techniques developed for use on all-cotton products can also be used successfully on manmade fiber blends containing a cellulosic component (either cotton or rayon).

Although some improvements have been made, even better permanent press for 100-percent cotton fabrics or for blend fabrics with high cotton content could prevent further penetration of manmade fibers into various end-use markets—particularly those for carded yarn products.

## Technical problems in textile manufacture

Spinning manmade fiber with cotton involves problems not confronted in spinning 100-percent cotton yarns. For example, the static electricity generated in the processing of manmade fibers must be kept to a minimum; this can be done by increasing humidity, which itself creates processing difficulties. There are numerous other adjustments of machinery and techniques that must be made. The preparation of blended fibers prior to spinning demands more rigid controls than preparation of 100 percent cotton requires. But once the techniques are learned, processing efficiency can be achieved.

Other factors remaining constant, yarn uniformity is usually correlated with yarn strength and appearance. Regardless of the blend ratios or types of fibers blended, the more homogeneous the roving, the greater the spinning efficiency and the fewer "ends down," or work stoppages, on the spinning frame. When blended yarns are made in Western Europe, fibers are usually blended during the drawing process by combining slivers of two or more unmixed fibers. This system produces roving and yarn that is not as homogeneous as that blended at the opening and picking stage in the yarn-manufacturing process. Because of the higher waste produced in drawing, it had not been considered economical to blend prior to drawing. However, owing to several factors, including narrower price differentials between cotton and some manmade fibers and recent modernization of textile machinery in the opening through carding processes, there is now a trend to blending fibers in the opening and picking process.

The various textile fibers have differences in important characteristics such as tensile strength, elongation, stiffness, specific gravity, and moisture regain, all of which affect processing performances.

These differences in characteristics between fibers can contribute to spinning difficulties when making blends. Processing equipment must be adjusted to take into account characteristics that cause various fibers to process differently.

Then too, despite claims of uniformity, manmade fibers show considerable variation in fiber characteristics within individual lots and between lots. These variations may occur in fiber length and other properties, which cause processing problems whether manmade fibers are used alone or in blends.

Blended yarn, particularly a draw-frame blend, is not as homogeneous as 100-percent cotton yarn or any other yarn made of one type of fiber, since it is difficult to produce without "thick and thin" places. For example, fiber processed to make blended yarn of 65/35 polyester-cotton may, in cross section, deviate considerably from the

Physical properties of selected fibers used in blending

| Item | Breaking tenacity[1] | | Specific gravity[2] | Standard moisture regain[3] | Standard elongation[4] |
|---|---|---|---|---|---|
| | Standard | Wet | | | |
| Natural fibers: | *Grams per denier* | *Grams per denier* | *Unit* | *Percent* | *Percent* |
| Cotton | 3.0-4.9 | 3.30-6.37 | 1.54 | 7.0-8.0 | 3-7 |
| Flax | 2.4-7.0 | -- | 1.50 | 12.0 | 3 |
| Silk | 2.8-5.2 | 2.50-4.50 | 1.25-1.35 | 11.0 | 13-31 |
| Wool | 1.0-1.7 | .76-1.63 | 1.32 | 17.0 | 25-35 |
| Manmade staple: | | | | | |
| Acetate | 1.2-1.5 | .80-1.20 | 1.32 | 6.0 | 25-45 |
| Acrylic | 2.0-3.5 | 1.80-3.30 | 1.14-1.19 | 1.3-2.5 | 20-50 |
| Nylon 6 | 2.5 | 2.00 | 1.14 | 4.5 | 37-50 |
| Nylon 66 | 3.5-7.2 | 3.20-6.50 | 1.14 | 4.0-4.5 | 26-65 |
| Polyester, regular tenacity | 2.5-5.0 | 2.50-5.00 | [5] 1.22 or 1.38 | [5] 0.4 or 0.8 | 12-67 |
| Polyester, high tenacity | 5.0-6.5 | 5.00-6.40 | [5] 1.22 or 1.38 | [5] 0.4 or 0.8 | 12-67 |
| Rayon, regular | .7-2.6 | .70-1.80 | 1.50-1.53 | 13.0 | 15-30 |
| Rayon, high wet modulus | 2.5-5.5 | 1.80-4.00 | 1.50-1.53 | 13.0 | 14-18 |

[1] The stress at which a fiber breaks. [2] The ratio of the weight of a given volume of fiber to an equal volume of water.
[3] The moisture regain of a fiber (expressed as a percentage of the moisture-free weight) at 70° F. and 65 percent relative humidity.
[4] Deformation caused by a tensile force, expressed as percentage of original length. [5] Depends on type.
Source: Manmade Fiber Producers Association, Inc., *Guide to Manmade Fibers,* Sept. 1969, and American Viscose Division, FMC Corporation, *Fiber Facts,* 1969-70.

norm. The fiber content might be 60 percent polyester and 40 percent cotton in some places and 70 percent polyester and 30 percent cotton in others.

Such variations cause the streaking so obvious in light-colored, light-weight blended fabrics. This variability in yarn uniformity also produces streaks in dyeing these fabrics, even in the darker shades, and affects the appearance of finished products, whether woven or knitted, since the dye takeup is not uniform. Dyeing blends of cotton and polyester fibers requires the use of two types of dye in order that the cellulosic and noncellulosic components develop the same color.

In contrast, the finishing of 100-percent cotton fabrics is simpler and better understood and requires only one type of dye. Tests have shown, however, that blends of 10 percent to 25 percent polyester with cotton can be dyed with cotton-dyeing procedures.

In the preparation of yarns for weaving, starch must be placed onto the warp yarns as they are wound onto the warp beam. If blends of cotton and noncellulosics are being processed, a synthetic starch must be used. The process differs somewhat from that used for all-cotton warps, necessitates some special handling procedures, and provides some problems in desizing. The scouring and bleaching processes, however, are basically the same for both all-cotton and blend fabrics.

Another problem is the affinity of blended fabrics, particularly polyester blends, for oily spots and other soil. This difficulty has spurred the development of soil release treatments, which have added to the cost of fabrics and have not been met with enthusiasm at the consumer level.

Permanent press finishes have been an important aspect of the popularity of polyester-cotton blends, but permanent press finishes also compound the problems associated with soil deposition on fabrics with hydrophobic fibers, such as polyesters. Special finishes have been developed to deal with the soil deposition problems associated with polyester-blend fabrics, but these have not been well received by end users because of the added cost and unpleasant "hand" such treatments impart. Some permanent press blends have a tendency to abrade and become discolored; therefore they are not suitable for uses where uniform appearance is important.

The tendency to pill is another problem with spun manmade-fiber yarns and fabrics, including blends. Low-twist yarns in which loose fibers occur are particularly vulnerable. In order to minimize the problem, singeing and/or shearing of polyester/cellulosic blends after dyeing have been advised by manmade fiber producers.

Static electricity from manmade fibers can be an annoying problem to users of blended fabrics as well as a difficulty during blend processing.

Other problems also exist. For example, mills making 100-percent cotton products have a ready market for the waste resulting from the various processes by which cotton is converted to end products. Blended waste, however, is not as readily saleable and often has no value but must be disposed of. Moreover, a mill that processes both 100-percent cotton products and blends must deal with the "fly" produced in the spinning process by physically separating the spinning of blended from the spinning of all-cotton products. Where this separation is not properly maintained the mixed "fly" contaminates pure cotton yarn and causes spots when dyed.

However, despite the many problems associated with blends and despite the advantages of working with 100 percent cotton, a growing number of mills in Western Europe, particularly in the United Kingdom and West Germany, are moving from pure cotton products to blends and manmade fiber products.

## Price and profit relationships

As in other businesses, profitability is the basis of textile and apparel production. The end products of textile mills and apparel manufacturers must be in demand at a margin that will yield a satisfactory return to the producer. Textile manufacturers aim to maximize profits by either producing long runs of standard goods on which they make a relatively low profit per unit but have a high volume of sales or by developing specialized products for which the market is limited but for which unit profits are higher. As a general rule, mill margins are wider both actually and relatively on higher priced fabrics than they are on lower priced fabrics.

Therefore, textile manufacturers make decisions based on the profitability of end products rather than on the narrow concern of fiber costs alone. Relative profitability is affected by many market forces not under the control of the textile manufacturer. Retail prices reflect the pull of demand as well as the push of costs. As indicated in this report, on the whole and for a myriad of reasons, branded manmade fiber blends have been more profitable to textile and apparel manufacturers than all-cotton products.

**Fiber costs.**—Some manufacturers claim that raw material price relationships have little or no bearing on decisions whether or not to blend yarns and fabrics; however, the mill adjustments that follow major price adjustments in the competitive fibers do not bear out this contention. While the cost of fiber in apparel or household items is but a small fraction of the price of the finished item, the relative cost of the raw material is significant to producers of yarns and fabrics.

Some comparative prices for cotton and manmade fiber staple are given in the following table.

**Cotton and manmade fiber staple prices in the European Communities and the United Kingdom in April-May 1970**

| Fiber and type | European Communities | United Kingdom |
|---|---|---|
| Cotton: | *Cents per pound* | *Cents per pound* |
| Strict middling 1 1/16 inches | 29.51 | 28.76 |
| Extra-long staple: | | |
| Sudanese Sakel, G5vs | [1] | [2]44.30 |
| Egyptian, Menoufi, FG | [1] | 63.40 |
| Manmade: | | |
| Rayon: | | |
| Regular (1 7/16 inches, 1.5 denier) | 22.50 | 23.00 |
| High wet modulus (1 7/16 inches, 1.5 denier) | 32.50 | 25.00-31.00 |
| Polyester: | | |
| Branded: | | |
| List price (1 1/2 inches, 1.5 denier and 3.0 denier) | 62.50 | 62.00 |
| Actual price (1 1/2 inches, 1.5 denier and 3.0 denier) | 53.00-55.00 | [1] |
| Unbranded (1 1/2 inches, 1.5 denier) | [3]39.00-41.00<br>[4] 45.00 | 46.45 |

[1]Not available. [2]Including cape surcharge. [3]EC source. [4]U. S. source. Price includes 9.8 percent ad valorem duty that prevails for the year 1970. In 1971, the rate is scheduled to be 9.4 percent and in 1972 and after, 9.0 percent ad valorem.

It should be noted that although a list price for polyester staple is shown in the immediately preceding table, it is probable that little or no polyester staple is traded at list. Most polyester staple is sold at a considerable discount off list, depending upon size of order, continuity of arrangements between buyer and seller, competitive conditions existing at the time contracts are made, and other market factors.

Several ways in which relative fiber costs may affect purchases between cotton and manmade fibers can be noticed from the table just given.

First, whereas cotton of longer staple is much more expensive than short staple, manmade fiber prices are the same for long and short staple. For fine yarn, fiber length is important. So on the basis of length alone, cotton is at a price disadvantage compared to manmade fibers. Fortunately, other attributes of cotton are often so much in demand that long and extra-long staple cottons are used despite their relatively higher prices.

On the other hand, for some end uses fiber strength and length are not important so that short staple, low-priced cottons are just as satisfactory as any manmade fiber. Such short-staple cottons are usually cheaper than most manmade fibers.

A very significant price relationship shown in the table is that between high wet modulus rayon and extra-long staple Egyptian or Sudanese cotton. Many spinners claim that the lower priced high wet modulus rayon is a good substitute for the much higher priced extra-long staple cotton.

It should also be noted that the prices quoted in the table for manmade fibers include delivery to mills. Costs of delivery from ports to mills and other handling charges must be added to the prices shown for cotton.

Also noticeable from the preceding table is the price differential between branded and unbranded polyester. If the use of a fiber brand name is not important to a spinner and unbranded polyester is available, it can be used at substantial savings. Price differences between branded and unbranded polyester vary according to market conditions. At the end of 1967 unbranded polyester fiber of U.S. and European origin was reported to be selling for 17 U.S. cents per pound less than branded fiber in France and 22 cents less in Belgium. In the same two countries, unbranded polyester fiber of Eastern European origin was selling for 35 cents a pound less than branded fiber. By the spring of 1970, the usual price spread between branded and unbranded polyester ranged from about 8 cents to 16 cents per pound.

**Other factors affecting fiber costs.**—To determine raw material costs, mills determine the cost of usable fiber by taking into account processing waste, which is different for different fibers.

Mill waste for cotton varies greatly from mill to mill depending upon mill cleaning, yarn count being produced, machinery speeds and settings, etc. Waste also varies by grade of cotton. The lower grades have more waste per pound, other factors being equal. No waste percentage would be universally valid, but it is estimated that gross waste in the production of carded yarns ranges from 8 to 18 percent of fiber put into process with an average of about 12 percent. If cotton is put through the further process of combing (as is required for fine, high-count yarns), waste ranges from 21 to 29 percent but averages about 26 percent.

On the other hand, because no preliminary cleaning is required, processing waste for manmade fibers is estimated to be about 4 percent or less.

In the determination of net fiber waste, gross processing waste factors should be reduced by the amount of fiber that is put back into processing—that is—reworked. To compute fiber costs, the resale value of fiber that cannot be reworked should also be taken into account. Resale value of waste varies greatly according to fiber quality and to the sources of waste during processing. For example, cotton "dusthouse" waste is estimated to be worth about 1 cent per pound; but comber noils, which come from combing high grade, extra-long cotton, are worth about 11 cents per pound. Waste from processing blends of two or more fibers is generally valueless or of minimum value.

There are differences of expert opinion whether, in computing cost of usable fiber, an adjustment should also be made for differences in specific gravity between cotton and certain manmade fibers—particularly polyester and nylon. The difference between polyester and nylon and cotton is about 20 percent. One pound of polyester or nylon staple consists of more fibers than 1 pound of cotton because the fibers are lighter in weight; consequently, it takes fewer pounds of such fiber than of cotton to make a given yardage of cloth.

**Fiber costs and yarn types.**—Based on fiber prices in the spring of 1970, fiber costs per pound for various types of yarn, adjusted only for gross mill processing wastes, are shown in the following table. This comparison shows that next to regular rayon yarn, carded cotton yarn had the lowest fiber costs. However, fiber costs for blends were lower than for 100-percent combed yarn using extra-long staple cotton. The table also shows the competitiveness between high wet modulus rayon and cotton in polyester blends.

Estimated fiber costs for various types of yarn in the European Communities, April-May 1970

| Type of yarn | Fiber costs[1] | |
|---|---|---|
| | Branded | Unbranded |
| | *Cents per pound* | *Cents per pound* |
| 65/35 polyester-carded cotton | 47.4-48.8 | 37.9-42.0 |
| 50/50 polyester-carded cotton | 44.1-45.2 | 36.8-39.9 |
| 15/85 polyester-carded cotton | ([2]) | 34.2-35.1 |
| 65/35 polyester-high wet modulus rayon | 47.7-49.0 | 38.2-42.3 |
| 50/50 high wet modulus rayon-carded cotton | -- | 33.4 |
| 25/75 regular rayon-carded cotton | -- | 30.6 |
| 100-percent regular rayon | -- | 23.4 |
| 100-percent carded cotton | -- | 33.1 |
| 100-percent combed cotton: | | |
| Sudanese Sakel, G5vs | -- | [3] 55.8 |
| Egyptian Menoufi FG | -- | [3] 79.9 |

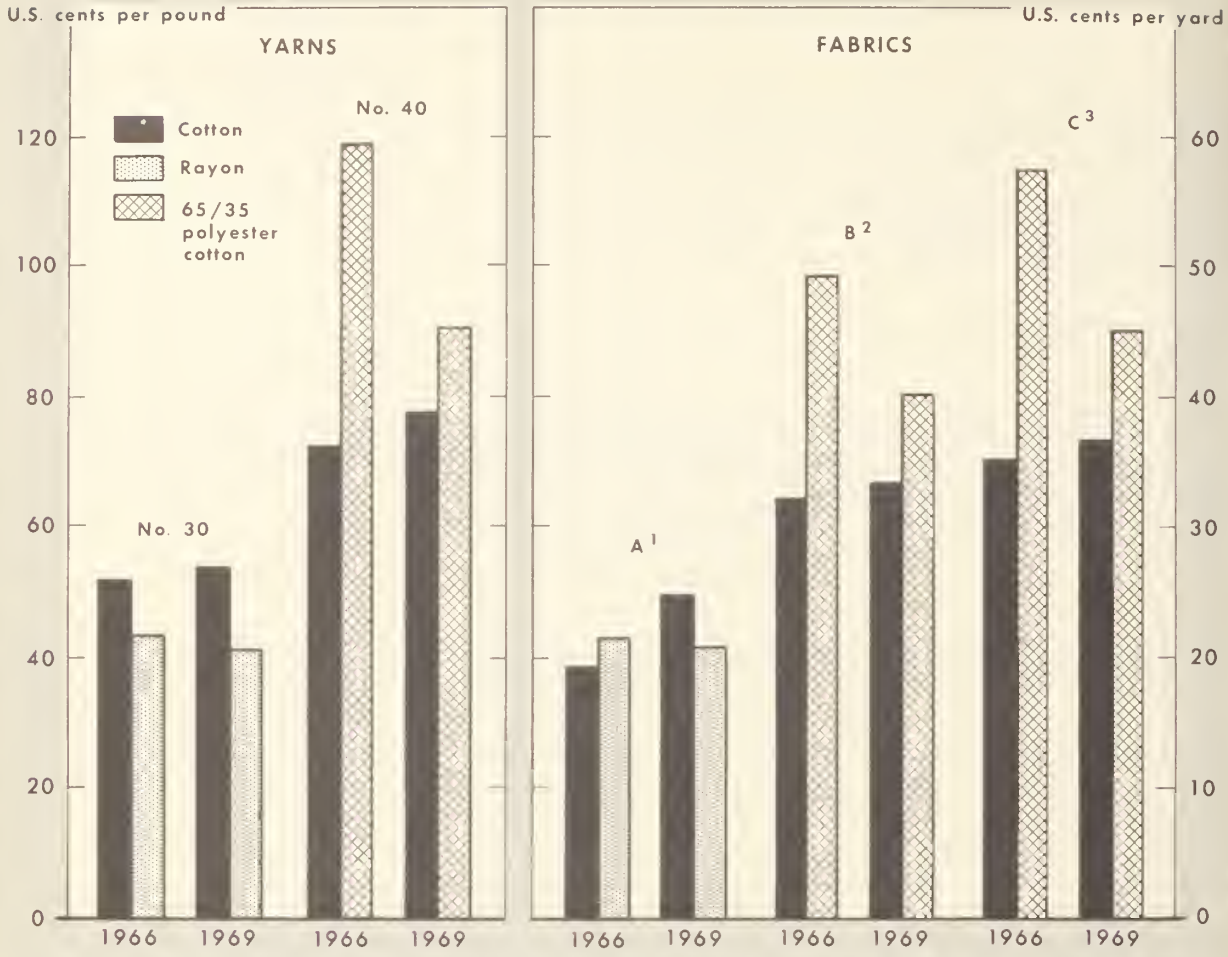
[1] Adjusted only for gross processing waste as follows: carded cotton, 12 percent; combed cotton, 26 percent; polyester and rayon staple, 4 percent. [2] Manmade fiber producers do not permit branded polyester to be used in such blend ratios.
[3] Based on cotton prices in the United Kingdom.
Source: Based on prices published in newspapers and journals of several countries in Western Europe and on unpublished materials.

The price relationship between cotton and rayon, particularly high wet modulus rayon, has generally been more of a determining factor in switching to blends than the price relationships between polyester and cotton. Mills in Western Europe turn to low-level rayon blending if cotton stocks are low and prices relatively high. When prices of high wet modulus rayon were reduced, Western European manufacturers became more interested in blending it with cotton and also began replacing cotton with high wet modulus in polyester blends. However, when the price difference between polyester and cotton is narrow, price relationships become an important factor. Lower prices for polyester staple that began in 1967 made it economical for manufacturers to turn to the use of polyester in carded-type yarn blends instead of largely limiting the use of polyester to combed-type yarns.

It is apparent that price relationships and the resultant relative profitability, rather than actual price levels, largely determine whether mills turn to manmade fibers as a substitute for cotton. Price relationships would have to change drastically, however, for this to be the deciding factor for a mill on all cotton to change to blends. The effect of changed price relationships for cotton, rayon, and polyester fiber from 1966 to 1969 in a typical Western European manufacturing firm are shown in the accompanying chart. The cost differential between all-rayon and all-cotton yarns and fabrics widened slightly, but the differentials between all-cotton and polyester-cotton blends of 65/35 ratio narrowed substantially.

**Mill cost decisions.**—The decision to switch from the production of all-cotton products to blends is not taken lightly, and a number of factors must be considered. The market for blended products in terms of price and volume in comparison to all-cotton products must be favorable to yield satisfactory profits. The following manufacturing considerations must be costed and evaluated: adjustment of processing speeds of spinning and weaving equipment; changes in dyeing and possibly other finishing processes; training of personnel accustomed to cotton products to the techniques of handling blends; and labor costs for adjustments in processing equipment—from opening and cleaning, through picking and carding, to roving and spinning. If a switch is made from processing cotton to processing rayon staple or to blending rayon staple with cotton, relatively little change of equipment and technique is required except in yarn preparation and in weaving. If a conversion is made to blending noncellulosic fiber, such as polyester or nylon, however, costly revamping of old mills or erection of new spinning and weaving facilities are necessary for the operation to be efficient.

## Cost Differentials of Yarns and Fabrics Using Cotton, Rayon, and Cotton-Polyester Blends




[1] Construction 68×66–30/30; bleached, width 36 inches. [2] Construction 94×70–40/40; bleached, width 36 inches. [3] Construction 129×66–40/40; bleached, width 36 inches.
Source: Kroese, W. T. 'Inter-fiber Competition — A Third and Final Performance of the Ballet of the Fibers.' in Cotton and Allied Textiles Industries, Vol. 10, Zurich, 1969.

Once a mill has switched from all cotton to blends, some of the same factors are brought into play for a reversion to all cotton. In addition, at least one other problem must be taken into account—the financing of increased fiber inventories, since an adequate supply of cotton must be kept by spinners. Manmade fibers are usually bought on the basis of periodic deliveries to meet anticipated spinning needs.

Studies have shown that when cotton has lost markets as a result of high prices relative to competing manmade fibers, only partial recovery, rather than complete recovery, of markets is achieved when more favorable price relationships are restored. It is extremely difficult for cotton to recover a market that has been lost or deeply penetrated.

Other competitive aspects have caused spinners to become interested in the production of blended yarns. Spinners who do not also carry out weaving operations find it necessary to meet the demands of their weaver and knitter customers for blended yarns. Manufacturers attempt to obtain special properties, characteristics, and end-use qualities by using yarns of manmade fibers of various types in various proportions. Although processing techniques may not be identical for blended yarn and for all-cotton yarn, there is little difference in processing costs between blends and all-cotton products until the fabric finishing stage. Consumer demand for "modern textiles" and for

"something new" have also been strong influences upon textile manufacturers to experiment with manmade fibers alone and in blends.

## Retailers and consumers

Retail stores in Western Europe today are able to provide customers with a wide choice of textile goods. Some outlets continue to deal only in high quality, conservative merchandise; others deal only in the least expensive lines. But a larger number operate in between these two extremes and carry textile products within a wide range of price and quality. Retailers in Western Europe usually hold no special brief for textile items of particular fibers, whether 100-percent cotton, linen, wool, silk, manmade fibers, or blends. The major objective is to fulfill the customer's needs in a reasonably effective way at the greatest total profit to the retail organization.

The heavy advertising campaigns of manmade fiber producers benefits the retailer both directly and indirectly. Producers' expensive promotion campaigns have caused manmade fiber brand names to become household words. Retail customers shop with preconceived ideas and look for certain products or certain end-use qualities based on advertising paid for and often conceived by manmade fiber producers. Most retailers appear to believe that cotton does too little advertising by comparison to counteract the intense efforts of the manmade fiber producers. There are indications that as promotion by fiber increases, so do sales. Since blended polyester-cotton apparel generally commands a higher price than all-cotton products, retailers "trade up" to such lines in order to increase their profit margins per unit and to maximize their total profits.

**Consumer choice.**—Consumers shopping for apparel look for end-use qualities, such as wash and wear, permanent press, and permanent pleat. Ease of care has substantial appeal when women work outside the home and thereby find fewer hours than full-time housewives to devote to the care of the family wardrobe and household textiles.

This was some of the attraction of various 100-percent manmade fiber products, such as woven nylon and polyester filament shirts and blouses, when they were first introduced for apparel. However, such products were uncomfortable to wear because they were not absorptive. They also yellowed with use, and developed "pills" on surfaces and edges where abrasion occurred. The wash-and-wear concept gave rise to the development of ease-of-care finishes for all-cotton products.

As with 100-percent manmade fiber products, consumers' experience with early wash-and-wear all-cotton products was often disappointing. They were priced higher than regular all-cotton goods, they showed poor abrasion resistance, they lacked strength, and they did not perform well as wash-and-wear products. Unfortunately, because of this experience, some consumers have deliberately avoided early-type 100-percent manmade fiber products and the all-cotton wash-and-wear and permanent press products that followed. Consumer lack of acceptance has in turn dampened the enthusiasm of retailers and textile manufacturers for these lines.

The use of permanent press finishes in Western Europe, especially in the United Kingdom, has developed at a more cautious pace than in the United States. However, permanent press is now heavily advertised and is gaining appeal. Although much improved all-cotton products are now available, wash and wear and permanent press are characteristics generally associated by consumers with manmade fiber and blended products. In the United Kingdom, cotton in blends is being increasingly replaced with high wet modulus rayon and other cellulosic manmade fibers. Western European spinners and weavers are now careful to use blends in suitable end uses from a performance and price point of view. But in some quarters there still remains some consumer prejudice against blends, possibly because of the difficulties previously associated with them.

**Price and utility.**—The situation in Western Europe concerning relative prices of all-cotton and blended textile products is mixed. In general, if a blend includes branded polyester, it is apt to be priced at a premium above other merchandise of the same relative quality. If the blends are of regular rayon with cotton, used to cheapen the article at the retail level, they are likely to be found in the lowest retail price lines.

Stores carrying high-quality, conservative merchandise feature all-cotton apparel as their best and most expensive lines—often in high-fashion, designer-styled clothes. They do not carry blended shirts because blends "would not be accepted" by their customers. On the other hand, although they are sometimes the same price for the same quality range, fine-quality blended shirts of polyester-cotton can also be found at prices in excess of those of fine-quality cotton. In Western Europe, the least expensive shirts are generally low-quality cotton but are sometimes 100-percent nylon knit.

Prices for blended polyester-cotton blouses generally exceed the prices of all-cotton blouses of similar type. But the prices of blouses of cotton and high wet modulus rayon blends rest between the lower priced cotton and the blended polyester-cotton.

Easy-care sheets of high wet modulus rayon-cotton blends with a 5- or 10-year wear-life guarantee have appeared in the United Kingdom market. These dry more quickly than polyester-cotton sheets and are lighter in weight than all cotton. Although there is additional cost at retail, a blended sheet that can be handled domestically without ironing instead of being sent to a commercial laundry to be washed and ironed will have lower maintenance expense to offset the initial higher cost. Polyester-cotton sheets first appeared in Western Europe in 1965 and continue to command premium prices; however, as competitive pressures increase, prices can be expected to come down. Carded 100-percent cotton sheets are generally the least expensive. But cotton-rayon sheets selling as "pure cotton" in Italy were available at prices about 25 percent cheaper.

In some countries a "pure cotton" label can conceal fiber content of less than 100 percent cotton that cannot be detected by the consumer. The poor performance of such adulterated fabrics makes the consumer think that "cotton isn't as good as it used to be."

Prices for piecegoods, which are relatively more important in Western Europe than in the United States, differ greatly by style. But 100-percent cotton goods, even the best quality wash-and-wear fabrics, generally sell for less than polyester-cotton blends.

In apparel items, polyester-cotton blends are often the best selling items at medium prices, while all-cotton items are either at the top of the price line or the lowest in price.

In general, customers appear willing to pay more for some types of blended textile items, especially those containing branded manmade fibers, than for plain cotton items. Customers expect to obtain better end-use qualities and/or longer wear life from them. Blends also appeal because they fit into the trend for lighter weight clothing and have a pleasant sheen generally associated with only the most expensive cottons.

While price is still important to some purchasers, consumers generally are now less concerned with the prices of textile products than with their utility and appearance—in contrast to the early postwar years. Shoppers look primarily for fashion and end-use qualities and may associate these with particular fibers on the basis of preconceptions developed by advertisements or from their experience with them. The appeal of blends has been based in large measure upon the wash-and-wear, wrinkle-resistance, permanent-press, quick-drying, and other such properties that have become associated with textiles of manmade fibers. The housewife in Western Europe enjoys ironing no more than the American housewife. And in Europe a higher proportion of women do laundry at home—partly because of the relatively high cost of commercial laundry service. However, relatively fewer homes than in the United States are equipped with automatic laundry equipment, particularly clothes dryers.

Institutional buyers find advantages in blends for some end uses. For example, hospitals in the United Kingdom found that high wet modulus rayon-cotton blended hospital gowns have a combed goods appearance for a carded goods price and are durable under frequent sterilization. Rental uniforms of polyester-cotton had longer wear life than all-cotton garments and, because of their lighter weight, resulted in lower laundering costs.

**Stains and discoloration.**—Despite the several advantages cited above, consumers have learned that blended products have numerous disadvantages. Spots, particularly oily spots, and stains are difficult to remove from polyester-blend and durable press fabrics. Moreover, most consumers know that white and light-colored blended fabrics discolor with use. The housewife does not know or care whether her problems are caused by stain absorption, soil attraction, soil redeposition, or electrostatic collection of soil; but the problem must be dealt with if her laundry is to look clean. New detergents and presoak chemicals for home laundry to deal with this problem are now being marketed. However, untreated cotton fabric is still considered the easiest to keep white or to keep a clear, light color and remains the standard of freshness.

**Disappearance of choice.**—Increased use of blended apparel and household items by European consumers may come about because of limited choices in retail stores. Such a development would echo the situation in the United States for some important apparel lines.

For example, in 1969, 90 percent of all business shirts manufactured by firms in the United States were made of blended fabric, and only 10 percent were all cotton. The proportions were exactly the reverse a few years earlier. Thus, the availability of all-cotton shirts of U.S. manufacture on retail shelves was sharply reduced so that a wider selection of price lines, styles, and color were on hand for blended products. It can be argued that U.S. manufacturers responded to consumers' demand for blended textile products by switching to blends in this way. But

the more likely reason for the shift to blends was the anticipation at the time the production schedules were established of lower relative profitability for all cotton in comparison to blended products.

If the market is saturated with blended products to the virtual exclusion of all-cotton products, consumers cannot exercise a free choice of fibers for the textile products they buy.

## THE ECONOMIC CLIMATE AND BLENDS

### Trading blocs

The full development of the European Communities (EC) and of the European Free Trade Association (EFTA), or their eventual combination into a single trading unit, will broaden the size of the home market for producers in these areas and provide them with larger market areas where, theoretically, goods may flow without tariff or nontariff barriers.

These enlarged trading areas have already provided, and will probably continue to provide, the impetus for textile companies in the EC and EFTA to reorganize and modernize into stronger economic units. As a result, the average level of production efficiency of the textile industry of Western Europe is being elevated.

During the transition to complete economic integration as envisioned by the Treaty of Rome, there was fear that it would become necessary for less efficient producers in the Common Market to undertake costly modernization programs and to utilize their productive capacity more intensively in order to remain competitive. Consolidation of small units and modernization of equipment and other measures are taking place without major upheaval. While the process is not yet complete, the rationalization of the textile industries of Western Europe is enabling the remaining stronger producers to meet better the competitive conditions that now prevail within these trading blocs, even with the complete removal of tariff barriers, and the lower textile tariffs to outsiders growing out of the Kennedy Round of tariff reductions.

Consolidation of firms and modernization of equipment also permit the stronger, more efficient units to increase their total sales and to improve their competitive position in export markets—especially in the more highly processed lines of textiles.

### Expanding manmade fiber production

In 1969, the countries of Western Europe produced about 5.9 billion pounds of all kinds of manmade fiber, including glass—more than double the amount produced in 1961. Production of all types of manmade fiber staple, which is spun on the cotton, woolen, and worsted spinning systems, continues to expand. But production of some types is increasing more rapidly than output of others.

The 1.7 billion pounds of cellulosic staple (rayon and acetate) produced in 1969 was practically the same average volume as in 1962-64. Production facilities are scheduled to expand about 24 percent over this level by the end of 1971, but expansion has been taking place mainly in the smaller producing countries and in the United Kingdom. The Netherlands has stopped producing, Switzerland is scheduled to stop, and West Germany is reducing capacity for rayon staple. There is some shift to the production of high wet modulus rayon staple that, for some end uses, performs better than the regular type of rayon, especially in blends with cotton and with polyester.

**Polyester supplies.**—While the production of cellulosic staple has been relatively stable since about 1965, production of noncellulosic staple (not including textile glass staple) has expanded sharply. It rose from 121 million pounds in 1959 to nearly 1.5 billion pounds in 1969. Production capacity is scheduled to expand to about 2.6 billion pounds by the end of 1971. All major types of noncellulosic fiber—nylon, acrylic, and polyester—have shown sustained growth. But as a competitor of cotton, the most important of these is polyester, which is considered to be the most versatile of the manmade fibers. Polyester staple production totaled 492 million pounds in 1969 in Western Europe compared with 42 million pounds in 1959 and an average of about 90 million pounds annually in the 1960-62 period. Capacity by the end of 1971 is expected to reach 883 million pounds.

Noncellulosic staple production 1959-69 and capacity March 1970 and December 1971 in Western Europe[1]

| Year | Staple fiber | | | | | |
|---|---|---|---|---|---|---|
| | Nylon | Acrylic[2] | Polyester | Olefin | Other[3] | Total |
| Production: | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* | *Mil. lb.* |
| 1959 | 35 | 25 | 42 | ([4]) | 19 | 121 |
| 1960 | 44 | 47 | 67 | ([4]) | 25 | 183 |
| 1961 | 48 | 57 | 83 | ([4]) | 29 | 217 |
| 1962 | 53 | 103 | 115 | ([4]) | 38 | 309 |
| 1963 | 71 | 139 | 127 | 9 | 40 | 386 |
| 1964 | 74 | 193 | 150 | 15 | 48 | 480 |
| 1965 | 90 | 270 | 195 | 17 | 32 | 604 |
| 1966 | 102 | 343 | 261 | 22 | 35 | 763 |
| 1967 | 107 | 404 | 277 | 27 | 31 | 846 |
| 1968 | 138 | 594 | 384 | 31 | 32 | 1,179 |
| 1969 | 156 | 736 | 492 | 42 | 31 | 1,457 |
| Capacity: | | | | | | |
| 1970 | 222 | 1,069 | 676 | 58 | 51 | 2,076 |
| 1971 | 263 | 1,352 | 883 | 59 | 51 | 2,608 |

[1] Includes Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom. [2] Includes modacrylic.
[3] Includes alginate, azlon, spandex or elastomer, saran, TFD-fluorocarbon, vinal, and vinyon. [4] Not available.
Source: *Textile Organon*, vol. 41, no. 6, 1970.

Whether or not advertising campaigns continue with the same force, aggressive selling will continue to be aimed at end uses now largely served by cotton. Manmade fiber producers will also continue to make technical assistance available, establish quality standards, test end products, and create new end uses—efforts directed at providing incentives for spinners and weavers to increase the use of their fibers. Considerable effort will be directed to pushing manmade fibers, either unblended or in blends, into end uses where cotton still retains a sizable market.

Manufacturers who have invested large sums in brand name advertising resist selling unbranded fiber as long as possible. But larger quantities of unbranded polyester are coming on the market as a result of (1) the augmented production of suppliers of branded polyester who are not finding markets for all their production at "branded prices" and (2) production of new suppliers with no established brand name for their product. The larger supplies of polyester fiber at lower prices have encouraged textile manufacturers to expand their use of this fiber in blends and, where suitable, in products containing 100-percent polyester fiber. Sometimes, given certain price relationships, polyester can profitably be substituted for cotton and rayon. It is possible that large increases in production of standard blended fabrics will reduce profitability and dampen some of the expansion in production of this type of goods.

## Low-cost textile imports

The rising volume of textile imports into Western European countries has some bearing on the relationship of blends to total production in the textile industries of Western Europe. Cotton textile imports into Western European countries rose from about 217,000 metric tons in 1961 to about 258,000 metric tons in 1968—an increase of 19 percent. On the other hand, manmade fiber textile imports rose from about 74,000 metric tons in 1961 to 155,000 metric tons in 1968—an increase of over 100 percent. In several countries, particularly West Germany and the United Kingdom, the proportion of imports to the total market for cotton yarns and fabrics has been high; on the other hand, Belgium, Luxembourg, and the Netherlands have taken a higher per capita volume of cotton fabric and textile

Imports of cotton textiles to major markets of Western Europe

| Country | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
|---|---|---|---|---|---|---|
| | *Mil. U.S. dol.* | *Mil. U.S. dol.* | *Mil. U.S. dol.* | *Mil. U.S. dol.* | *Mil. U.S. dol.* | *Mil. U.S. dol.* |
| Belgium | 130,075 | 135,530 | 161,710 | 72,401 | 82,605 | 98,980 |
| France | 127,195 | 127,685 | 171,912 | 84,101 | 99,251 | 161,764 |
| Italy | 68,770 | 62,008 | 82,596 | 70,047 | 67,230 | 80,927 |
| Netherlands | 271,676 | 297,848 | 359,487 | 125,995 | 139,793 | 158,403 |
| United Kingdom | 326,428 | 253,924 | 268,439 | 295,610 | 314,043 | 295,724 |
| West Germany | 401,735 | 553,757 | 622,199 | 202,558 | 281,456 | 353,487 |

Source: Reports of the Cotton Textiles Committee, General Agreement on Tariffs and Trade, Geneva.

imports of all types than France, West Germany, and Italy. Imports of cotton textiles by the major markets of Western Europe are shown in the accompanying table for the period 1964-68.

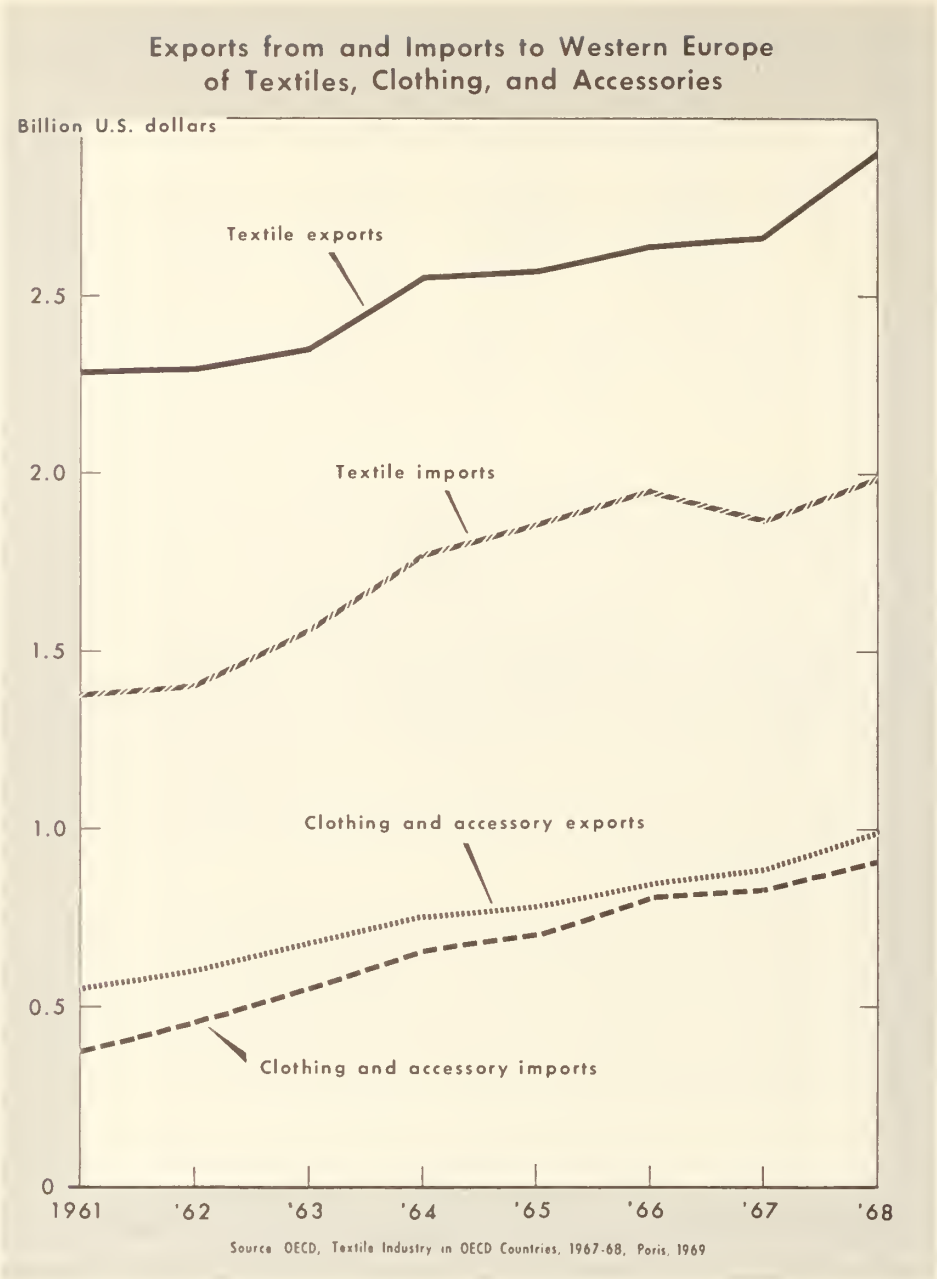
Imports of textiles of all types into Western Europe have risen from $1.4 billion in 1961 to $2 billion in 1968. But exports have also risen so that Western Europe remains a large net exporter. Imports of clothing and accessories rose from $375 million in 1961 to $904.3 million in 1968. And while exports also rose sharply, Western Europe's net export position dropped from $162.3 million to $75.5 million during that period.

In most Western European countries, restrictive devices are used to some degree to moderate the volume of cotton and manmade fiber textile imports. Among these are import quotas unilaterally imposed, bilateral agreements between trading partners, or the operation of the Noordwijk Agreement, which prohibits the "transformed" low-cost imported "cotton and staple fiber" goods from shipment into signatory countries. Tariff rates are also an impediment to imports from outside the EC and EFTA trading blocs. But important reductions in tariffs were made to "outsiders" during tariff negotiations held under the auspices of the General Agreement on Tariffs and Trade (GATT) in 1967.

Full reductions of tariffs from the latest GATT negotiations are scheduled to be completed on January 1, 1972. Both the EC and the United Kingdom reduced tariffs more for manmade fiber textiles than for cotton textiles. Manmade fiber textile and cotton textile tariffs will be practically the same within the EC and in the United Kingdom, although there will be some differences in rates between the EC and the United Kingdom. As a consequence, there will be greater competitive price pressure from manmade fiber textile imports after January 1, 1972 than before. While classification for trade purposes in Western Europe depends on the chief fiber by weight of a blended textile item, most blends would be classified as manmade fiber textiles.

In many countries of Western Europe, prices of yarns and fabrics have been kept at lower levels than would have otherwise prevailed by the impact of substantial quantities of these low-priced textile imports. As conditions permit, manufacturers are beginning to move away from the production of basic, low-end, coarse, and standard items that are no longer relatively as profitable as products that are more fashion directed, high styled, high quality, and/or higher in price. Production of fancy, highly finished, and blended textile products is increasing, partly because imports have not yet seriously threatened the market for these goods and profit margins remain relatively higher. The potential market for such upgraded goods is more limited than the market for standard products but it is likely to expand with expected increases in disposable consumer income.

While the textile industries of Japan, Hong Kong, Korea, and Taiwan can manufacture practically any type of fabric that can be produced in Western Europe, other Asian sources have not yet reached this level of technical skill and versatility. As the newer textile exporting countries gain skill, they will produce a wider range of merchandise to sell on the export market. Thus, production of fancy blends in Western Europe as a hedge against import competition from the newer exporting countries can only be of a temporary nature.




## OUTLOOK

### Cotton's competitors

Continued and increasing competition for cotton seems likely. As indicated, various economic forces at work foster blends at the manufacturing, retail, and consumer levels. In addition, there is a strong move toward multifiber textile products, with end-use qualities a major factor in consumer selection. There is also continued pressure from the urgent need of manmade fiber producers to dispose of their expanding volume of manmade fiber production.

Two other developments contribute to greater competition for cotton: (1) Improvements in the age-old technique of knitting and the growing importance and popularity of knit goods, and (2) increase in production and use of nonwoven textile products. Apparel and some household and industrial goods that were formerly made of

woven fabric of all cotton or cotton-manmade fiber blends are now being made of knits and nonwoven products. This development has favored manmade fibers. Texturized filament yarn, particularly polyester and nylon, are now widely used for knit goods. Some knits are also made with blended yarns of natural and manmade fibers.

Cotton has long been important in end uses like knit underwear and sweatshirts and is now being used for some types of knit outerwear. But the use of cotton in knits has not kept pace with growth in the total knit goods market. Cotton is important for some types of nonwoven products, but, if trends in Western Europe are similar to those in the United States, it has lost relatively in this rapidly growing market to rayon and other manmade fibers.

In this rapidly changing textile climate, the interests of textile and apparel producers and consumers alike are constantly shifting to new fabric types and clothing styles. Fiber allegiance is difficult to maintain under such circumstances, even for manmade fiber products.

In attempting to hold markets, however, cotton has a number of intrinsic advantages in Western Europe and elsewhere. Much of the mill equipment that is presently installed has been engineered for the use of cotton fibers rather than for manmade fibers or for blends. Spinners find cotton easy to handle, and their labor force is well acquainted with the technique of cotton spinning. Cotton has good dyeability and is suitable for many end uses. Many consumers are accustomed to the qualities of cotton and prefer household items and clothing of cotton. Consumers consider cotton apparel more "healthful" to wear than clothes of other fibers because of its washability, absorptiveness, and comfort. Many Western European housewives still boil clothes; cotton stands up better than manmades under such treatment. Despite these advantages, cotton interests must relentlessly seek ways to improve cotton's competitive position in the marketplace.

The spinner of yarn is concerned primarily with the profitability of his products. If over the long run, conditions are such that products of any particular fiber offer relatively poorer profit than products of any other fiber or combination of fibers, there will be a turn to the more profitable fibers. While raw material supply and price is only one side of the formula, an adequate supply on a continuing basis of grades and staple lengths of cotton needed for various end products at competitive prices is basic to a spinner's long-term commitment to cotton use.

## Cotton takes the challenge

Foreign textile and apparel manufacturers universally believe that cotton's competitors have done a much better job with technical services and assistance than cotton.

**Promotion.**—In the United States research projects of great value are conducted on cotton fiber and cotton processing, particularly by the Southern Utilization Research and Development Division (known as the Southern Laboratory) of the U.S. Department of Agriculture in New Orleans. Research abroad is also conducted under the auspices of the International Institute for Cotton (IIC). Yet, in order for more of these research results to reach the foreign spinners, weavers, finishers, and apparel manufacturers, an intensive program is needed involving personal liaison and services between research organizations and potential end users. Some of the information may come to the attention of manufacturers by means of research journals and technical meetings, but the full benefit that might be derived has been hampered in part by the lack of an adequate program involving technical personnel as well as technical information. Particularly, approach by technical personnel and dissemination of information in the native language of foreign manufacturers is important.

There has been, however, some effort to bring new ideas about processing techniques, finishes, and products to foreign manufacturers in order to encourage their use of cotton and to make it more profitable. On occasion, technicians from the U.S. Department of Agriculture have served as traveling ambassadors for cotton. Further, there has been representation at foreign trade fairs—an activity also sponsored by the U.S. Department of Agriculture.

Also, to assist in the dissemination of new research findings, the IIC cosponsored the First International Cotton Research Symposium (SIRTEC), which was organized by the Textile Institute of France and held in April 1969. Concurrently, an exhibition was held of new developments in cotton that featured displays relating to open-end spinning, twistless spinning, knitting, easy-care finishing, and flameproofing. Another such conference was held in England in mid-1970; additional meetings are planned.

**Technical advances.**—A Technical Research Division of the IIC was formed in 1967. Its main area of interest, determined largely by the findings of market research, is in the area of cotton products with excellent easy-care properties. First, research had centered on the synthesis of new and improved chemicals; and then attention moved to the possible modification of the structure of the cotton fiber itself in order to make it more responsive to easy-care processing. Product development work is also being undertaken. The IIC does not have a research

laboratory of its own, but works with existing research organizations. It also maintains close liaison with national textile industries to insure their interest and increase the chances of commercial application of research findings.

The following important developments of value to cotton have been pioneered in the Southern Laboratory and have been commercialized in the United States: New types of processing machinery (such as the SRRS opener); flame retardance and flame retardant treatments; chemically modified treatments (as opposed to addictive treatments) for cellulose that provide heat and mildew resistance; reactive dyes for cotton that yield bright colors; and applications for cotton stretch fabrics.

Inventions of the Southern Laboratory are in the public domain in the United States, but inventors have the right to take out foreign patents privately, and it is possible for a prospective user to communicate with the inventor of a process in which he is interested about the situation in his country.

While none of the above listed inventions bear directly on blends, they offer new aspects to keeping cotton in a strong competitive position, which itself would contribute to slowing the trend to blends.

The impetus for "acknowledged blends," that is, those advertised by the manufacturer, was based on easy-care properties, particularly permanent press. While a full discussion of mechanical and chemical finishing treatments and their relative merits is outside the scope of this report, improved permanent press finishes for all-cotton products are, as indicated in this study, an important aspect of meeting the competition of manmade fibers. Although the permanent press finishes that are now available for all-cotton products are greatly improved over those of a few years ago, much research continues to be directed toward improved methods of achieving permanent press characteristics for all cotton products.

**Support for low-level blends.**—Cotton interests have traditionally supported promotion of only 100-percent cotton goods. This type of policy was followed by the wool interests until a few years ago when they considered it to their advantage to promote some specific wool-manmade fiber blend items for specific end uses. In September 1970 the Cotton Producers' Institute, a cotton group organized in 1967 to promote cotton in the United States, moved away from the traditional position by announcing support for blends under some circumstances. A change of policy has not occurred in the International Institute for Cotton or the Cotton Council International. However, in view of the trends, it may be necessary for cotton interests in Western Europe and elsewhere to test blends with low manmade fiber and high cotton content for specified end uses.

If, as a result of such tests, it were found that low-level blends outperformed blends of high manmade fiber content, 100-percent manmade fiber products, or 100-percent cotton products, the establishment and sponsorship by cotton interests of quality-controlled low-level blends for specific end uses could be seriously considered. This step would be feasible only if the long-term prospects for retaining a sizable share of specific end-use markets could be foreseen. Price relationships, money available for promotion, the possibility of obtaining improved permanent press characteristics with all cotton, and other factors would have to be weighed in making such a decision.

If such a move were made, the use of special trade names for such cotton-sponsored and -promoted blends might be able to staunch some of the continued erosion of cotton markets by high-level manmade fiber blends. For example, socks made of yarns that are more than 95 percent cotton and having an elastomer fiber core freely compete with those made of 100 percent stretch nylon or 100 percent acrylic fiber. Aiding the promotion of such core yarn socks and other high cotton content products could be expected to help recover some of the markets now lost to manmade fibers.

In the meantime, manmade fiber interests in Western Europe have their sights trained on the large end-use markets that are now served entirely or mainly by cotton and are fostering blends containing 50 percent or more manmade fibers for these markets. While the traditional ratio of 65 percent polyester fiber may give way to something less, there is sure to be a greater percentage of manmade fiber in the blends promoted by manmade fiber interests than is required to achieve specific end-use characteristics.

In the competition between cotton and manmade fibers, cotton must continue to attempt to regain and expand markets by promotion and market and technical research fortified by good marketing practices and adequate supplies of needed grades and staple lengths of cotton at competitive prices.